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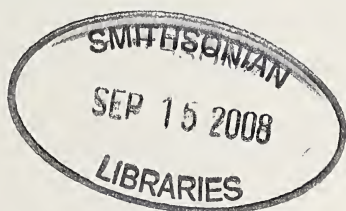
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Factors Influencing the Distribution of Overwintered Bullfrog Tadpoles (*Rana catesbeiana*) in Two Small Ponds

Abstract.

We studied the effects of vegetation, temperature, dissolved oxygen, and depth on the distribution of overwintered bullfrog tadpoles, *Rana catesbeiana*, during the early spring within two small ponds (Spring Peeper Pond and Olde Minnow Pond) in central Ohio. Vegetation and water temperature significantly influenced tadpole distribution in Olde Minnow Pond, whereas oxygen significantly influenced tadpole distribution in Spring Peeper Pond. Water depth did not affect tadpole distribution in either pond.

In more northern populations, American bullfrog tadpoles (*Rana catesbeiana*) typically overwinter. Some observations suggest that bullfrog tadpoles shift their habitat use as they grow from the shallows along a pond's edge when small to the deeper waters at the center of a pond when larger (e.g., Werner, 1992; Smith and Rettig, 1996). We investigated the distribution of overwintered American bullfrog tadpoles within two small ponds in central Ohio, USA during the early Spring. We were particularly interested in determining if various physical and biotic characteristics could explain variation in tadpole distributions within and between these ponds. Within-pond distributions of anuran larvae can be a function of water depth, presence of aquatic vegetation, substrate type, dissolved oxygen content, and temperature (e.g., Noland and Ultsch, 1981; Alford, 1986; Warkentin, 1992; Nie et al., 1999; Ultsch et al., 1999; Smith et al., 2003).

Materials and Methods.

The two ponds we investigated, Spring Peeper Pond and Olde Minnow Pond, are located on the Denison University Biological Reserve, Granville, Licking Co., Ohio, USA (40°05'00N, 82°31'05"W; elevation = 308 m asl). The ponds are separated by 100 m. In a typical year, Spring Peeper dries up in late August or early September after a summer drought which typically lasts from June through August; however for 2 or 3 years prior to this study, Spring Peeper had not dried up and held water year round. Olde Minnow is a permanent pond. Both ponds are supplied by springs and run-off, and are known to support several amphibian species (Schultz and Mick, 1998; Smith et al., 2003).

We collected information on abiotic variables and bullfrog tadpole distributions once a week from 25 March to 11 April 2006. Each week we sampled up to 13 sites around the perimeter of each pond. We assumed that because of temporal changes in the pond and time between samples that the samples from different dates were independent (see Smith et al., 2003). We thus pooled data within each pond for our analyses.

In order to estimate the abundance of tadpoles at each site, We used dipnets to complete 3 1 m long sweeps at each site, with ample time between sweeps to allow for tadpoles to return to the site. The number of tadpoles was recorded after each series of sweeps. Vegetative cover for each site was visually estimated using a pre-determined scale from 1 to 5, with 1 denoting no vegetation, and 5 denoting dense vegetation. Dissolved oxygen and water temperature were measured at each site using a YSI 550A meter. Each of these measurements was taken halfway between the surface of the water and the bottom of the pond. Depth was measured using a meter stick. Regression analyses were used to examine the relationship between the number of tadpoles and vegetative

cover and abiotic factors within the ponds.

Results.

The number of bullfrog tadpoles was positively correlated with vegetative cover in Olde Minnow Pond (Bullfrog tadpoles = $0.037 + 0.889(\text{vegetation index})$; $n = 27$, $r^2 = 0.183$, $P = 0.0026$) but not in Spring Peeper Pond ($n = 28$, $r^2 = 0.038$, $P = 0.32$). Tadpole abundance was positively related to water temperature in Olde Minnow Pond (Bullfrog tadpoles = $-5.46 + 4.04(\text{temperature})$; $n = 27$, $r^2 = 0.171$, $P = 0.032$), but not in Spring Peeper Pond ($n = 28$, $r^2 = 0.091$, $P = 0.12$). There was no significant relationship between dissolved oxygen and tadpole abundance in Olde Minnow Pond ($n = 23$, $r^2 = 0.012$, $P = 0.68$), but a significant positive relationship was found in Spring Peeper Pond (Bullfrog tadpoles = $-20.6 + 5.99(\text{DO})$; $n = 23$, $r^2 = 0.171$, $P = 0.0053$). Depth did not affect tadpole number in either Spring Peeper Pond ($n = 28$, $r^2 = 0.092$, $P = 0.12$) or Olde Minnow Pond ($n = 27$, $r^2 = 0.048$, $P = 0.27$).

Discussion.

Within each individual pond, different factors significantly affected tadpole distribution. Vegetation and water temperature significantly influenced tadpole distribution in Olde Minnow Pond, whereas dissolved oxygen had a significant influence on tadpole distribution in Spring Peeper Pond. Water depth did not affect tadpole distribution in either pond. Our results are partially consistent with previous laboratory experiments and field observations on the habitat use of bullfrog tadpoles. Overwintered bullfrog tadpoles from Ohio have been shown to prefer vegetation to bare areas in laboratory studies (Smith and Doupnik, 2005); however, overwintered tadpoles from Michigan did not (Smith, 1999). Oxygen concentration has been shown to be important in habitat selection of bullfrog tadpoles (e.g., Nie et al., 1999; Ultsch et al., 1999), as has temperature (Hutchison and Hill, 1978; Crawshaw et al., 1992; Ultsch et al., 1999).

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Note on Reproduction of two species of microteiid lizards, *Leposoma southi* and *Ptychoglossus plicatus* (Squamata: Gymnophthalmidae)

Leposoma southi and *Ptychoglossus plicatus* are common diurnal microteiid lizard inhabitants of leaf-litter in lowland rain forests and are found from eastern and southwestern Costa Rica to western Colombia (Scott, 1976; Savage, 2002). Information on reproduction of *L. southi* is in Savage (2002). I know of no published information on reproduction of *P. plicatus*. The purpose of this note is to present information on the reproductive cycle of both species from a histological examination of museum specimens from Costa Rica and Colombia.

Thirty-two *Leposoma southi* (13 males, mean snout-vent length, SVL = 33.4 mm \pm 0.87 SD, range = 32-35 mm; 14 females, SVL = 35.0 mm \pm 1.9 SD, range = 33-38 mm; 5 neonates, SVL = 15.4 mm \pm 0.55, range = 15-16 mm) from Colombia and Costa Rica and 15 *Ptychoglossus plicatus* (9 males, SVL = 52.0 mm, \pm 7.3 SD, range = 43-63 mm; 5 females, SVL = 53.4 mm \pm 4.4 SD, range = 50-61 mm; 1 sub-adult male, SVL = 39 mm \pm 0.00) from Costa Rica were examined from the herpetology collection of the Natural History Museum of Los Angeles County, Los Angeles, California. Male and female mean body sizes (SVL) were compared with an unpaired *t* test using InStat (vers. 3.0b, Graphpad Software, San Diego, CA). Male and female samples of *L. southi* from Colombia and Costa Rica were combined as their mean SVLs were not significantly different (unpaired *t*-test).

The following specimens of *L. southi* were examined: **Colombia**, Chocó District, LACM 45010, 45012-45015, 72817, 72819, 72820, 72824, 72826-72828, 72830, 72831, 72833, 72834, 72838, **Costa Rica**, Puntarenas Province, LACM159625-159628, 159630, 159634, 159635, 159638-159641, 159644, 159645, 159648, 159650. *Leposoma southi* were collected 1963 to 1973.

The following specimens of *P. plicatus* were examined: **Costa Rica**, Heredia Province, LACM 159263. Limón Province, LACM 159278. Puntarenas Province, LACM 114219, 159257, 159262, 159264, 159266, 159267, 159275, 159277. San José Province, LACM 159260, 159261, 159267, 159269, 159272, 159276. *Ptychoglossus plicatus* were collected 1969 to 1985.

Gonads were dehydrated in ethanol, embedded in paraffin, sectioned at 5 μ m and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Enlarged follicles (> 3 mm) and/or oviductal eggs were counted; no histology was done on them.

All *L. southi* males were undergoing spermiogenesis (sperm formation). The seminiferous tubules were lined by spermatozoa or groups of metamorphosing spermatids; epididymides contained sperm. Samples examined by month were: March ($n = 2$), May ($n = 2$), June ($n = 5$), July ($n = 3$), August ($n = 1$). The presence of males producing sperm during five months of the year suggest a prolonged period of spermiogenesis. The smallest reproductively male measured 32 mm (LACM 72828) and was collected in June from Colombia.

Leposoma southi females were significantly larger (SVL) than males (unpaired *t* test, $t = 2.83$, $df = 25$, $P = 0.01$). Females exhibited reproductive activity in all months sampled (Table 1). There was no suggestion (corpora lutea from a previous clutch and yolk deposition for a subsequent clutch) in the same female or (oviductal eggs and concomitant yolk deposition) for a subsequent clutch. However, failure to find such females may be due to my small sample sizes. Mean clutch size for 11 *L. southi* females (enlarged ovarian follicles > 3 mm or oviductal eggs) was 2.0 ± 0.0 SD. There are other reports of clutches of two eggs for *L. southi*. These are Taylor (1956) from Costa

Table 1. Monthly distribution of reproductive conditions in the ovarian cycle of 14 *Leposoma southi* from Colombia and Costa Rica.

Month	n	Early yolk deposition	Follicles > 3 mm length	Oviductal eggs
March	1	1	0	0
May	4	1	3	0
June	3	1	0	2
July	6	0	4	2

Rica and Fitch (1970) from Panama and Costa Rica. Beebe (1945) reported clutches of two eggs for the congener *Leposoma percarinatum* from Guyana as did Duellman (1978) for *L. parietale* from Ecuador. The smallest reproductively active females measured 33 mm and were undergoing early yolk deposition (LACM 159630) or contained oviductal eggs (LACM 72820, 72824, 72830, 159645). The presence of reproductively active *L. southi* females during a four month period (Table 1) suggests an extended reproductive cycle. Savage (2002) reported reproduction of *L. southi* occurred through most of the rainy season (May to November). Telford (1971) noted yolked follicles in his available monthly samples of *L. southi* (November to July) from Colon Province, Panama. I noted presumed neonates of *L. southi* in the LACM collection (15-16 mm SVL) from May ($n = 1$), June ($n = 2$), July ($n = 1$), August ($n = 1$) also suggesting an extended period of reproduction.

Considering *P. plicatus*, there was no significant size difference (SVL) between males and females (unpaired *t*-test, $P = 0.70$). The following *P. plicatus* males were undergoing spermiogenesis: March ($n = 1$), May ($n = 5$), August ($n = 3$); epididymides contained sperm. The smallest reproductively active males (undergoing spermiogenesis) measured 43 mm SVL (LACM 159264, 159278) and were collected in May. One male (LACM 114219) from May (39 mm SVL) contained spermatids, but no spermatozoa and was classified as a sub-adult.

Mean clutch size for five *P. plicatus* females (enlarged ovarian follicles > 3 mm or oviductal eggs) was 2.0 ± 0.0 SD. All five females examined were reproductively active with enlarged follicles (> 3 mm) or oviductal eggs: May ($n = 1$), June ($n = 1$), August ($n = 2$), September ($n = 1$). One of the August females (LACM 159272) contained oviductal eggs and concomitant yolk deposition for a subsequent egg clutch suggesting *P. plicatus* females may produce multiple egg clutches in the same year. The smallest reproductively active female (follicles > 3 mm) measured 50 mm SVL (LACM 159276) and was from May.

Harris (1994) reported clutch sizes of two eggs for the congeners *Ptychoglossus bicolor* and *P. stenolepis* from Colombia. Dixon and Soini (1975) reported clutches of two eggs for *Ptychoglossus brevifrontalis* from April, June, July, September and December in Peru, indicating an extended reproductive season. Duellman (1978) reported two oviductal eggs for *P. brevifrontalis* females from Ecuador. These observations suggest clutches of two eggs may be typical for *Ptychoglossus*.

Considering other studies, Telford (1971) reported differences in timing of the reproductive cycles of two species of gymnophthalmid lizards from Panama. Reproduction in *Gymnophthalmus speciosus* occurred from late October through March whereas reproduction in *Leposoma rugiceps* extended from May through November (Telford, 1971). In a detailed study of reproduction in the gymnophthalmid *Potamites ecleopus* from Peru, (Sherbrooke, 1975) reproduction occurred throughout the year, with some reduction during the dry season.

In conclusion, *L. southi* and *P. plicatus* exhibit prolonged periods of reproduction and produce clutches of two eggs. This appears to be in accordance with the observation of Fitch (1982) who reported there were reproductive "patterns" characteristic for species, genera and higher taxonomic categories of tropical reptiles. Examination of additional samples will be needed to fully characterize the reproductive cycles of *L. southi* and *P. plicatus*. Also, the examination of gonads of other species of gymnophthalmid lizards from Central and South America are needed before the variations in the timing of their reproductive cycles can be ascertained.

I thank Christine Thacker (LACM) for permission to examine specimens and Sean Kark (Whittier College) for assistance with histology. *Leposoma southi* and *Ptychoglossus plicatus* from Costa Rica are part of the Costa Rica Expeditions (CRE) collection donated to LACM by Jay M. Savage in 1998.

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Note on Reproduction of the Sonoran Leaf-toed Gecko, *Phyllodactylus homolepidurus* (Squamata: Gekkonidae) from Sonora, Mexico

The Sonoran Leaf-toed Gecko, *Phyllodactylus homolepidurus* is known from western Sonora, Mexico and also occurs on Isla San Pedro Nolasco (ca 15 km SW of Punta San Pedro, N of Guaymas, Sonora, Mexico) (Grismer, 2002). While there are no reports on its reproductive biology, hatchlings have been seen in early October (Grismer, 2002). The purpose of this note is to report information on its reproductive biology from a histological examination of gonadal material from museum specimens.

Twenty *P. homolepidurus* (7 males, mean snout-vent length, SVL = 56.7 mm \pm 2.7 SD, range = 53-61 mm; 13 females, mean SVL = 58.1 mm \pm 7.0 SD, range = 40-68 mm) were examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California. *Phyllodactylus homolepidurus* were collected 1964 to 1975; MEXICO, Sonora: LACM 3255, 58025-58027, 25086, 59951-59954, 59957-59959, 59963, 59964, 93783-93785, 93788, 93792, 122509.

Gonads were dehydrated in ethanol, embedded in paraffin, sectioned at 5 μ m and stained with Harris hematoxylin followed by eosin counterstain (Presnell and Schreibman, 1997). Enlarged follicles (> 4 mm) and/or oviductal eggs were counted; no histology was done on them. Male and female mean body sizes (SVL) were compared with an unpaired *t* test using Instat (vers. 3.0b, Graphpad Software, San Diego, CA).

There was no significant size difference between male and female *P. homolepidurus* mean body sizes (SVL) (unpaired *t* test, *t* = 0.489, *df* = 18, *P* = 0.63). Two stages were present in the testicular cycle: (1) regression, germinal epithelium is reduced and consists of 1-2 layers of interspersed spermatogonia and primary spermatocytes, seminiferous tubules are reduced in size; (2) spermiogenesis, seminiferous tubules are lined by spermatozoa, clusters of metamorphosing spermatids are present; epididymides contain sperm. Testes were examined from June (*n* = 5) 1 regression, 4 spermiogenesis; August (*n* = 1) 1 regression; December (*n* = 1) spermiogenesis.

Monthly stages in the ovarian cycle are in Table 1. Four stages were found: (1) No yolk deposition, "inactive" follicles with no vitellogenic (= yolk) granules present; (2) Early yolk deposition, vitellogenic granules present; (3) Enlarged follicle (> 4 mm) for future clutch and one oviductal egg (soon to be deposited); (4) Oviductal egg (soon to be deposited). Reproductively active females were noted in June (late spring). The observation of hatchling *P. homolepidurus* in October (Grismer, 2002) would support deposition of eggs in late spring or early summer. The presence of one June female (LACM 59954) with a shelled oviductal egg for an upcoming clutch and an enlarged follicle (> 4 mm) for a subsequent clutch indicates the likelihood that *P. homolepidurus* produces multiple clutches in the same year.

Other species of *Phyllodactylus* from South America (*P. kofordi*, *P. reissii*) and southern Mexico (*P. muralis*, *P. tuberculosus*, *P. lanei*) exhibited prolonged reproductive cycles with reproductive activity in much of the year (Dixon and Huey, 1970; Goldberg, 2007; Dixon, 1964; Ramirez-Sandoval et al., 2006). In contrast, *Phyllodactylus xanti* from southern California, exhibited a "temperate" seasonal reproductive cycle in which spermiogenesis occurred in spring, regression in summer and recrudescence (= recovery of germinal epithelium for the next period of sperm formation) in autumn (Goldberg, 1997). My finding of *P. homolepidurus* males undergoing sperm

Table 1. Monthly distribution of reproductive conditions in the ovarian cycle of 13 *Phyllodactylus homolepidurus* from Sonora, Mexico.

Month	<i>n</i>	No yolk deposition	Early yolk deposition	Follicle > 4 mm length and oviductal egg	Oviductal eggs
June	8	4	2	1	1
July	1	1	0	0	0
September	3	3	0	0	0
December	1	1	0	0	0

formation in late spring (June), one regressed male from summer (August) and one December male undergoing spermiogenesis from December as well as inactive females from July, September and December suggests timing of the reproductive cycle may be similar to that of *P. xanti*. Other lizards of the North American southwest also reproduce in spring-early summer; see for example, *Sceloporus occidentalis* (Goldberg, 1973, 1974) and *Sceloporus vandenburgianus* (Goldberg, 1975). Grismer (2002) reported *P. homolepidurus* is probably not active the entire year which would tend to support my suggestion that it has a seasonal reproductive cycle. Examination of additional *P. homolepidurus* are required to further elucidate its reproductive cycle.

I thank Christine Thacker (LACM) for permission to examine *Phyllodactylus homolepidurus* and Sean Kark (Whittier College) for preparation of histology slides.

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The Amphibians and Reptiles of Erie County, Pennsylvania

Brian S. Gray and Mark Lethaby

Abstract.

Forty – five amphibian and reptile species are documented from Erie County. Current status, natural history, dates of observation, and geographic distribution of these species are discussed. Salamander diversity and snake diversity were highest in Millcreek Township, with eleven and ten species, respectively. Frog diversity was highest in Girard and Millcreek Townships and Presque Isle, all with nine species each. The Five-lined Skink, the county's only lizard, is restricted to Conneaut and Springfield Townships. Presque Isle had the greatest diversity of turtles, with ten chelonian species documented there. Greatest overall diversity (amphibians and reptiles combined) was Millcreek Township, with thirty six species. The number of species recorded for a township should not be interpreted as reflecting the actual number of species occurring there, since surveying efforts have tended to be concentrated in areas with publicly accessible land. However, suitable habitat may be lacking in some areas, e.g. Franklin Township, where the landscape is dominated by agriculture and residential development.

Introduction.

Erie County is located in northwestern Pennsylvania, with its northern edge bordered by approximately 43 miles of Lake Erie shoreline. The county has a fairly rich herpetofauna due to the variety of habitats contained within a diverse landscape. The northern tier of the county is within the Central Lowland Province, which is characterized by low ridges of sand and gravel. Forest vegetation in this region is primarily beech/maple. The Appalachian Plateaus Province is a highland with hilly topography and deep valleys due to stream erosion (Barnes and Sevon, 1996). Forest vegetation in the Appalachian Province is composed primarily of northern hardwoods (birch, beech, maple and hemlock). The two major drainage basins in the county are the Lake Erie drainage, characterized by shale-bottomed streams, often in deep valleys, and the Ohio drainage, with meandering, gravel-bottomed streams. Erie County is within the southern boundary of the Late Wisconsinan Glaciation, which produced several lakes, swamps, and bogs in the region. The peninsula of Presque Isle State Park on the Lake Erie shoreline is a distinctive feature of the landscape that hosts a number of species that do not occur elsewhere in the county.

The purpose of this work is to provide a thorough summary of the current state of knowledge regarding the county's amphibians and reptiles. We used our field notes, correspondence with reliable persons, and the published and unpublished literature pertinent to Erie County. Each species account contains the following information (if available): known species distribution in the county, earliest and latest annual dates of observation, natural history information, and a list of museum specimens collected from Erie County. The following museum collection records were consulted to generate the lists of specimens: American Museum of Natural History (AMNH), Carnegie Museum of Natural History (CM), Cleveland Museum of Natural History (CMNH), Edinboro University of Pennsylvania (EUP), Museum of Comparative Zoology (MCZ), University of Colorado Museum, Boulder (UCM), University of Michigan Museum of Zoology (UMMZ), State Museum of Pennsylvania (SMP), Sternberg Museum of Natural History (MHP), The Natural History Collections of the Tom Ridge Environmental Center at Presque Isle (TREC), the United States National Museum (USNM), and Gannon University (GU). In addition to these, one of the authors' (BG) personal collection of shed snake skins was also used. An asterisk represents mounted shed skin material in the Brian S. Gray collection, and unmounted material from the same specimen is in the Sternberg Museum of Natural History.

The bibliography at the end of this work is meant to provide a comprehensive list of publications that are pertinent to the herpetology of Erie County.

The Pennsylvania Fish and Boat Commission is responsible for regulations pertaining to reptiles and amphibians in the state. The following Erie County reptile and amphibian species have no open season: Eastern Hognose Snake (*Heterodon platirhinos*), Eastern Ribbon Snake (*Thamnophis sauritus*), Queen Snake (*Regina septemvittata*), Shorthead Garter Snake (*Thamnophis brachystoma*), Smooth Green Snake (*Liochlorophis vernalis*), Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*), Four-toed Salamander (*Hemidactylium scutatum*), Jefferson Salamander (*Ambystoma jeffersonianum*), Mudpuppy (*Necturus maculosus*), Striped Chorus Frog Complex (*Pseudacris triseriata* ssp.), Blanding's Turtle (*Emydoidea blandingii*), Eastern Box Turtle (*Terrapene carolina carolina*), Spotted Turtle (*Clemmys guttata*), and Wood Turtle (*Glyptemys insculpta*). The daily limit is zero, and possession limit is zero on these species. They may be possessed only with a permit issued by the Commission (Pennsylvania Fish and Boat Commission, 2007. Pennsylvania Fishing Summary, Summary of Fishing Regulations and Laws). If a specimen of any of these species is found in Erie County, good quality photographs showing diagnostic characters should be taken, and the observation should be reported to the Pennsylvania Online Herpetological Atlas (<http://webSPACE.ship.edu/tjmare/herp.htm>). Additionally, the authors are interested in observations of these species in the county and may be contacted directly.

Amphibians.

Twenty-two species of amphibians have been reported to occur in Erie County. However, two of these species – *Eurycea longicauda* and *Pseudacris triseriata* – are undocumented.

Salamanders are the most diverse group of amphibians to occur in Erie County and are represented by 13 species.

Eastern Hellbender, *Cryptobranchus alleganiensis alleganiensis*. The Eastern Hellbender is an inhabitant of streams with a moderate to swift current, and a gravel or sandy bottom with large flat rocks (Hulse et al 2001). In Erie County it is an uncommon salamander, being found only in the French Creek watershed. This species has been found in Amity, LeBoeuf, and Waterford Townships. A sample of ten Erie County specimens had a mean TL of 421.8 mm (sd=53.8, range 305-508). This species has been observed between 21 June and 10 September, but due to its aquatic nature, it is likely to be active in all months.

Specimens: UMMZ 75981

Mudpuppy, *Necturus maculosus maculosus*. The Mudpuppy is found in Lake Erie and Presque Isle Bay, and has also been found in Amity, Conneaut, LeBoeuf, North East (Lake Erie shoreline), Springfield, Venango, Washington and Waterford townships. Inland populations are apparently restricted to Conneaut Creek and the French Creek drainage. Swanson (1948) stated that he had taken mudpuppies at the outlet of Edinboro Lake. In 2002, a massive die-off of mudpuppies occurred in Lake Erie, which was attributed to an outbreak of botulism (Bartlett, 2002). A total of 712 dead mudpuppies were counted along less than one mile of shoreline in North East Township on 30 June 2002. On 14 July 1997, eggs (n=17) were found attached to the bottom of a rock in French Creek. Mudpuppies have been taken in a trawl net from Lake Erie by the Pennsylvania Fish and Boat Commission at a depth of 17.4 m (57 ft). The Mudpuppy has been observed between 15 April and 10 October in Erie County, but like the Hellbender it may be active in all months.

Specimens: CM 35238; CM 37292; CM 41285; CMNH 10210; EUP 115; GU 28; TREC A-014; TREC A-027

Jefferson Salamander, *Ambystoma jeffersonianum*. The Jefferson Salamander is uncommon in Erie County, being known from sites in Amity, Harborcreek, Millcreek, North East, and Union townships. An environmental impact study (Aquatic Ecology Associates, 1977a, b) of what is now State Game Lands 314, and property east of Conneaut Creek in Ohio reported *A. jeffersonianum* from along Turkey Creek in Ashtabula County. Additional surveys are needed to determine whether this species occurs in Springfield Township. The Jefferson salamander needs hardwood or mixed forest with vernal pools in which to breed. *Ambystoma jeffersonianum* is usually observed during the spring breeding season, and adults are rarely encountered outside this season. Five Erie County *A. jeffersonianum* had an average SVL of 76.6 mm (sd=0.9, range 75-77), and TL of 157.2 mm (sd=1.1, range 156-159). In Erie County, Jefferson Salamanders have been observed from 27 February to 15 June.

Specimens: AMNH 160139 – 160157; AMNH 163452 – 163456; AMNH 167073 – 167089; AMNH 167090 – 167096; CM 115957; TREC A-001

Spotted Salamander, *Ambystoma maculatum*. The Spotted Salamander is a common salamander in Erie County. Like the Jefferson Salamander, the Spotted Salamander is an inhabitant of wooded areas that contain vernal pools for breeding habitat. It is known from Presque Isle State Park and also Amity, Conneaut, Fairview, Girard, Greene, Greenfield, Harborcreek, Millcreek, North East, Springfield, Union, Venango, and Waterford townships. The average SVL of a sample (n=20) of Erie County Spotted Salamanders was 88.4 mm (sd=8.4, range 68-102), TL was 170.6 (sd=17.5, range 128-195). The Spotted Salamander has been found between 1 March and 28 October in Erie County.

Specimens: AMNH 159642 – 159657; AMNH 166573; AMNH 166574; CM 1698; USNM 396999; USNM 397021; USNM 397022; TREC A-015; TREC A-017

Eastern Red-spotted Newt, *Notophthalmus viridescens viridescens*. The Eastern Red-spotted Newt is common in the county, and has been observed in a variety of permanent and temporary aquatic habitats. Juveniles (efts) are frequently observed moving about the forest floor after rains. *Notophthalmus viridescens* has been observed in Amity, Girard, Greenfield, Harborcreek, LeBoeuf, Millcreek, North East, Springfield, Summit, Union, Venango, Waterford, and Wayne townships. Eastern Red-spotted Newts have been observed from 20 March to 30 October in Erie County.

Specimens: AMNH 166793 – 166795; AMNH 159806 – 159810; CM 1636; CM 1638; CM 4488; CM 5038; CM 5415 – 5417; CM 5426; CM 5429; CM 29884; USNM 396919;

TREC A-025; TREC A-030

Northern Dusky Salamander, *Desmognathus fuscus fuscus*. This species is common in and along streams and seeps. The Northern Dusky Salamander has been found in the City of Erie, as well as Amity, Concord, Conneaut, Fairview, Girard, Greene, Greenfield, Harborcreek, McKean, Millcreek, North East, Springfield, Union, Washington and Venango townships. Two Erie County specimens were 30 and 51 mm SVL, and 58 and 101 mm TL. The Northern Dusky Salamander has been found between 1 March and 14 November. On 30 June 1999 in Millcreek Township, a female was found under a log in a seep brooding seventeen eggs.

Specimens: AMNH 41493 - 41495; AMNH 159863 – 159872; AMNH 166629 – 166645; CM 28811; CM 28812; CM 30321; CM 30322; CM 30415; CM 155289; EUP 98 - 105, GU 45; TREC A-002; TREC A-016; TREC A-031

Allegheny Dusky Salamander, *Desmognathus ochrophaeus ochrophaeus*. The Allegheny Dusky Salamander is more terrestrial than the former species, and is commonly found a consider-

able distance from water. *Desmognathus o. ochrophaeus* is a common species in Erie County, and has been found in Amity, Conneaut, Fairview, Girard, Greene, Harborecreek, McKean, Millcreek, North East, Springfield, Union, Venango, Washington, Waterford, and Wayne townships. A sample of seventeen Erie County Allegheny Dusky Salamanders averaged 36.2 mm SVL (sd=7.2, range 22 – 56), and 72 mm TL (sd=17.7, range 45 – 125). In Erie County, the Allegheny Dusky Salamander has been found between 8 February and 30 October.

Specimens: AMNH 41483; AMNH 41491; AMNH 41492; AMNH 159883 – 159893; AMNH 166668 – 166671; CM 28813; CM 29878; CM 29879; CM 30320; USNM 396979 – 396990; TREC A-008

Northern Redback Salamander, *Plethodon cinereus*. The Northern Redback Salamander is one of the most widespread and abundant salamanders encountered in wooded areas in Erie County. This species has been found in Amity, Conneaut, Fairview, Girard, Greene, Greenfield, Harborecreek, LeBoeuf, Millcreek, North East, Springfield, Union, Venango, Washington, Waterford, and Wayne townships. The leadback phase of this species is rare in the county, and is only known from a site in Millcreek Township. Northern Redback Salamanders with highly variable pigment mottling were seen at Headwaters Park in Millcreek, with individuals varying from mostly red to mostly black. The average TL of six Millcreek Township *P. cinereus* was 54.9 mm (sd=24.5, range 19-72). Northern Redback Salamanders in Erie County have been observed from 1 March to 18 November.

Specimens: AMNH 159477 – 159483; AMNH 166843 – 166853; CM 5419; CM 5420; CM 5428; CM 29877; CM 37219; CM 91432; CM 91433; EUP 33 - 36, EUP 62-64; TREC A-032, USNM 396889 – 396915; USNM 396923 – 396952; USNM 396954 – 396964; USNM 396967 – 396977; USNM 396993 – 396998; USNM 397000 – 397020

Northern Slimy Salamander, *Plethodon glutinosus*. The Northern Slimy Salamander is frequently found on rocky slopes in forested areas. In Erie County, it has been observed in Conneaut, Girard, Greene, Greenfield, Harborecreek, Millcreek, Springfield, Union, Venango, Washington, and Wayne townships. Two Northern Slimy Salamanders from Millcreek Township were 35-52 mm SVL, and 62-100 mm TL. In Erie County, the Northern Slimy Salamander has been found between 5 April and 16 October.

Specimens: AMNH 159923 – 159925; CM 5037; CM 5418; CM 5427; CM 37217; CM 37218; USNM 396916 – 396918; USNM 396953; USNM 396965; USNM 396978

Four-toed Salamander, *Hemidactylium scutatum*. The Four-toed Salamander is the smallest and least commonly seen species of salamander found in Erie County. Adults of this species attain a maximum total length (TL) of 102 mm (Conant and Collins, 1998). Four Millcreek Township individuals had a mean SVL of 33.9 mm (sd=4.9, range 27-38), and TL of 52.3 mm (sd= 22.1, range 34-82.6). This diminutive salamander is found in forested areas that contain bogs, woodland swamps, or vernal pools in which to breed. It has been found in Millcreek, Springfield, Union, and Waterford townships. The Four-toed Salamander has been observed from 31 March to 28 October in Erie County.

Specimens: AMNH 166752 – 166754; CM 5421; CM 5422; USNM 396920 – 396922

Northern Spring Salamander, *Gyrinophilus porphyriticus porphyriticus*. The Northern Spring Salamander is infrequently seen in Erie County. It is a denizen of springs, seeps, and well shaded cool streams. In Erie County, there are records from Greene, Greenfield, Harborecreek, Millcreek, North East, and Venango townships. This species seems to be absent from the western portion of the county. In Erie County, the Northern Spring Salamander has been found between 6

April and 4 November. However, it is likely to be active for a more extended length of time due to its primarily aquatic nature.

Specimens: AMNH 159882; CM 344; TREC A-026

Northern Red Salamander, *Pseudotriton ruber ruber*. The Northern Red Salamander is found in shallow springs and streams that are usually well shaded, and have a rocky substrate, but may be found in slow, muddy or silty streams with decaying vegetation. We have typically found *Pseudotriton r. ruber* larvae in the latter habitat. *Pseudotriton r. ruber* is not encountered very often in Erie County, and is known from Amity, Fairview, Girard, Greene, Harborcreek, Millcreek, and Venango townships. A Millcreek Township individual was 79 mm SVL, and 120 mm TL. The Northern Red Salamander has been observed from 6 April to 10 October in Erie County.

Specimens: AMNH 159961; CM 37211; GU 44; USNM 396966

Northern Two-lined Salamander, *Eurycea bislineata*. The Northern Two-lined Salamander is a common streamside salamander in the county. *Eurycea bislineata* has been observed at sites in Amity, Conneaut, Fairview, Girard, Greene, Greenfield, Harborcreek, McKean, Millcreek, North East, Springfield, Summit, Union, Venango, Washington and Waterford townships. A female was found attending a clutch of fifty-two eggs that were adhering to the underside of a rock in Mill Creek on 27 May 2005. Observations of the Northern Two-lined Salamander in Erie County were between 30 January and 6 November.

Specimens: AMNH 41191; AMNH 41192; AMNH 148922 – 148924; AMNH 159763 – 159766; AMNH 166705; AMNH 166706; CM 28814; CM 30323 – 30325; CM 155287; CM 155288; EUP 37, TREC A-007; TREC A-010

Anura.

Nine species of anurans are known to occur in Erie County.

Eastern American Toad, *Anaxyrus americanus americanus*. This species of toad is common in a variety of habitats in Erie County. *Anaxyrus a. americanus* has been reported from the City of Erie, as well as Amity, Conneaut, Fairview, Girard, Greene, Greenfield, Harborcreek, LeBoeuf, McKean, Millcreek, North East, Springfield, Summit, Union, Venango, and Waterford townships. Four Erie County individuals averaged 52.4 mm SVL (sd=35.3, range 19-88.9). The Eastern American Toad has been observed between 27 March and 18 October in Erie County.

Specimens: CM 2086; CM 2094; CM 5423; CM 36865; CM 37220; GU 18; TREC A-018

Fowler's Toad, *Anaxyrus fowleri*. Fowler's Toad is uncommon in Erie County, and is only known from Presque Isle State Park in Millcreek Township, and the mouth of Elk Creek in Girard Township. *Anaxyrus fowleri* prefers soils that are sandy and well drained. This species occasionally hybridizes with the Eastern American Toad. It is not known whether hybridization occurs at Presque Isle. Three Fowler's Toads from Presque Isle averaged 57.7 mm SVL (sd=5.1, range 52-62). The Fowler's Toad has been observed from 4 April to 3 October in Erie County.

Specimens: CM 2084; CM 2085; CM 2087; CM 2142; CM 2143; CM 4489; CM 9966; CM 12221; CM 12270 – 12273; USNM 39841; TREC A-009

Northern Spring Peeper, *Pseudacris crucifer crucifer*. While the Northern Spring Peeper is common in Erie County, it is more likely to be heard than seen. During the breeding season, this species is found in marshes, swamps, the edges of ponds, wet fields and in vernal pools. Outside

the breeding season *P. c. crucifer* returns to wooded areas.

It has been found in Amity, Conneaut, Fairview, Girard, Greene, Greenfield, Harborcreek, LeBoeuf, Millcreek, Springfield, Union, Venango, Waterford, and Wayne townships. In Erie County, the Northern Spring Peeper has been observed as early as 6 January, and as late as 28 October.

Specimens: AMNH 159396; CM 1996; CM 2002; CM 5954; TREC A-020

Gray Treefrog, *Hyla versicolor*. The Gray Treefrog is common in the county, but like the peeper, is usually heard and not seen. *Hyla versicolor* is an inhabitant of deciduous forests near the wetlands that this species needs for breeding. It has been observed in Amity, Conneaut, Fairview, Girard, Greene, LeBoeuf, Millcreek, Springfield, Venango, and Waterford townships. The Gray Treefrog has been found between 14 April and 6 October in Erie County.

Specimens: CM 119119; SMP- H2525

Bullfrog, *Lithobates catesbeianus*. The Bullfrog is found in permanent bodies of water in Erie County. It has been observed in Amity, Concord, Conneaut, Girard, Greene, Greenfield, Harborcreek, LeBoeuf, McKean, Millcreek, North East, Springfield, Union, Venango, and Washington townships. In Erie County, The Bullfrog has been observed between 12 March and 20 October.

Specimens: CM 30311; CM 30312; CM 30314; CM 30315; GU 5; UMMZ 84472;

UMMZ 84473

Green Frog, *Lithobates clamitans melanota*. The Green Frog is a common frog in Erie County, being found in the City of Erie, as well as Amity, Concord, Conneaut, Fairview, Girard, Greene, Greenfield, Harborcreek, LeBoeuf, McKean, Millcreek, North East, Springfield, Union, Venango, Washington, and Waterford townships. *Lithobates c. melanota* can be found in a wide variety of habitats, such as ponds, marshes, swamps, the edges of lakes, sluggish portions of streams, and even puddles. Four *Lithobates clamitans melanota* from Erie County averaged 75.2 mm SVL (24.4, range 40-95). The Green Frog has been observed as early as 6 January and as late as 30 October in Erie County.

Specimens: AMNH 159455; AMNH 166900; CM 1861 – 1870; CM 1874 – 1878; CM 4490; CM 5425; CM 30313; CM 30316; CM 30326; CM 30327; CM 30416; CM 30417; CM 32531; CM 33674; GU 9; GU 76; UMMZ 84474

Pickerel Frog, *Lithobates palustris*. The Pickerel Frog is found in the weedy edges of ponds, swamps, vernal pools, and shallow streams, and in nearby terrestrial habitats. *Lithobates palustris* is a fairly common frog and has been found in Fairview, Girard, Greene, Greenfield, LeBoeuf, Millcreek, North East, Springfield, Summit, Union, Venango, and Wayne townships. Two Millcreek Township individuals were 30-31.8 mm SVL. The Pickerel Frog in Erie County has been found between 31 March and 30 October.

Specimens: AMNH 166915; CM 1743; CM 9802; CM 144187; GU 8

Northern Leopard Frog, *Lithobates pipiens*. The Northern Leopard Frog is not as common as the Pickerel Frog, and may have declined in the region. This species prefers grassy areas, such as marshes, but may also be found along the edges of ponds, swamps, lakes, and streams. *Lithobates pipiens* has been found in Amity, Conneaut, Girard, Greene, Greenfield, LeBoeuf, Millcreek, Springfield, Union, Venango, and Waterford townships. This species may be declining at Presque Isle State Park (Lethaby, 2001). Declines elsewhere within the species range have been reported (Lannoo, 1998; Lannoo, 2005). A Presque Isle specimen was 58 mm SVL. The Northern

Leopard Frog in Erie County has been observed between 21 March and 9 November.

Specimens: CM 1739; CM 1740; CM 1803 – 1819; CM 2702 - 2705; CM 4491; CM 5424; CM 12222; CM 32530; CM 33630; GU 70

Wood Frog, *Lithobates sylvaticus*. The Wood Frog is, as its common name implies, a species of wooded areas. In Erie County the Wood Frog has been observed in Amity, Conneaut, Fairview, Girard, Greene, Greenfield, Harborcreek, Millcreek, North East, Springfield, Union, Venango, and Waterford townships. Three Erie County Wood Frogs averaged 54.2 mm SVL (sd=11.0, range 46-66.7). The Wood Frog has been found from 27 February to 1 November in Erie County.

Specimens: AMNH 166949; CM 1946; CM 30310; CM 37212; CM 37213; GU 10; TREC A-019

Reptiles.

Twenty – three reptile species are known to occur in Erie County. Snakes are the most diverse group and are represented by thirteen species. However, the Eastern Hognose Snake may have been extirpated from the county.

Queen Snake, *Regina septemvittata*. The Queen Snake is primarily an inhabitant of lotic habitats. The streams where *R. septemvittata* is found usually are lined with shrubs and small trees, in which these snakes bask. Crayfish, the Queen Snake's primary food, is also a necessary component of the habitat. In Erie County, the Queen Snake is known from Elk Creek and Conneaut Creek in the following townships: Conneaut, Girard, McKean, Millcreek (Presque Isle), and Springfield. The Presque Isle specimen (CM 1936) was collected in 1906 by Atkinson. McPherson (1982) also reported this species from Presque Isle. However, recent surveys at Presque Isle have not found *Regina septemvittata* (McKinstry et al, 1991; Hughes and Schnars, 2007). Queen Snakes in Erie County have been observed between 14 May and 25 September. McKinstry and Felege (1974) caught a specimen that was 35 cm TL, and weighed 8 grams. Scott Bloomstine (pers. com.) collected a female from McKean Township that gave birth to 10 neonates during the first week of September.

Specimens: BG 069*; BG 221; BG 242*; BG 244; CM 1936; MHP 9975; MHP 9976; TREC R-033

Northern Water Snake, *Nerodia sipedon sipedon*. This species is common throughout the county, and likely occurs in all townships. It has been observed from Amity, Concord, Fairview, Girard, Greene, Greenfield, Harborcreek, LeBoeuf, McKean, Millcreek, North East, Springfield, Union, Washington and Waterford Townships. Although it is more frequently encountered along the edges of streams, *Nerodia s. sipedon* may be found along lakes, ponds, swamps, and vernal pools. On 6 May 2004, a "mating ball" was observed at Asbury Woods in a buttonbush wetland. The "ball" consisted of four males attempting to copulate with a female. Scott Bloomstine (pers. comm.) reported a female that gave birth to 26 neonates during August 2004. The largest known litter from an Erie County *N. sipedon* was 38 neonates. McKinstry and Felege (1974) reported an average total length of 57 cm (range 30 – 106 cm), for fifteen specimens from Erie County. Northern Water Snakes have been observed from 31 March to 15 November in Erie County.

Specimens: BG 039; BG 063*; BG 065; BG 099*; BG 106; BG 168*; BG 170; BG 188*; BG 191*; BG 225*; BG 228*; BG 229*; BG 231; BG 285*; BG 301*; BG 316; BG 319; BG 323; BG 324; BG 343; BG 371; CM 473; CM 1476 – 1484; CM 1506 – 1518; CM 33677; EUP 135, GU 54; MHP 9903 – 9910; MHP 11840; MHP 11855; TREC R-001; TREC R-016UMMZ 75945; USNM 396991;

Northern Brown Snake, *Storeria dekayi dekayi*. This species is common in areas that contain old field habitat in Erie County, even in urban and disturbed areas. The Northern Brown Snake has been found in the City of Erie; at Presque Isle State Park; and in Amity, Concord, Conneaut, Girard, Greenfield, Harborcreek, LeBoeuf, McKean, Millcreek, North East, Springfield, Union, Venango, Waterford, and Wayne Townships. Litters from three Erie County females ranged from 10 – 19 (Table 1). McKinstry and Felege (1974) reported an average TL of 280 mm (range 130 – 380 mm) for twenty eight Erie County specimens. Average weight for these same specimens was 8 grams (range 1 – 22 g). Our sample of Erie County specimens ($n=27$) averaged 227.6 mm SVL ($sd=42$, range 119.2–304), and 290.3 mm TL ($sd=50.4$, range 155.8–382); weight for fifteen Millcreek specimens averaged 6.7 g ($sd=4.0$, range 3–14.25). Dates of parturition, with litter size in parentheses for three Erie County individuals was 13 August (10), 16 August (17), and 20 August (19).

Northern Brown Snakes in Erie County have been observed as early as 6 January and as late as 4 November.

Specimens: BG 017*; BG 070; BG 083*; BG 101; BG 114*; BG 137; BG 157*; BG 161*; BG 166*; BG 172*; BG 177*; BG 178*; BG 182*; BG 186*; BG 193*; BG 195*; BG 258; BG 277; BG 313; BG 320; BG 326 – 328; BG 336; BG 337; BG 339; BG 340; BG 344 – 346; BG 348 – 353; BG 355; BG 358; BG 359; BG 368; BG 375 – 378; BG 380; BG 381; BG 383; BG 384; BG 386 – 389; BG 391; BG 392; BG 395; BG 396; BG 399; BG 401; BG 403; BG 405 – 407; BG 409; BG 426; CM 1708 – 1737; CM 1902 – 1914; CM 4221; CM 5351; CM 27711; CM 29883; CM 51601; CM 53679; CM 53680; CM 144184; EUP 120; MHP 9981 – 9985; MHP 9987 – 9995; MHP 11838; MHP 11861; GU 56; GU 81; GU 82; TREC R-014

Northern Redbelly Snake, *Storeria occipitomaculata occipitomaculata*. This species is common in wooded and ecotone areas where forest and old fields converge. The Northern Redbelly Snake has been observed in Amity, Greene, Harborcreek, LeBoeuf, Millcreek, Northeast, Springfield, Summit, Union, Venango, Waterford, and Wayne Townships. This species has also been found in the city of Erie (Bob Wellington pers. comm.). A female gave birth to 8 neonates on 27 July 2002; neonates were 66 – 68 mm SVL and 86 – 90 mm TL. McKinstry and Felege (1974) report an average TL of 300 mm (range 250 – 350 mm) for ten Erie County specimens. Five additional Erie County individuals averaged 246 mm SVL ($sd=14$, range 234.9–267.5), and 303.6 TL ($sd=19.7$, range 291–338.1). Melanistic individuals have been found near West Springfield and west of the Erie International Airport. Northern Redbelly Snakes have been observed from 30 March to 28 October in Erie County.

Specimens: BG 038; BG 040*; BG 071; BG 074; BG 171*; BG 216; BG 246*; BG 289*; BG 299*; BG 303*; CM 27733; CM 144170 – 144173; CM 144182; CM 144183; GU 80; MHP 10014 – 10017; MHP 11837; MHP 11851; MHP 11864; TREC R-004; TREC R-005; TREC R-038.

Shorthead Garter Snake, *Thamnophis brachystoma*. The Shorthead Garter Snake prefers open habitats with low herbaceous cover, such as meadows and old fields, and is rarely found within densely forested areas. The Shorthead Garter Snake has been found within the City of Erie, at Presque Isle State Park, and in Amity, Millcreek, Springfield, Summit, Union, and Wayne Townships. *Thamnophis brachystoma* appears to be more common in the eastern two thirds of the county, and at a few sites is abundant. It has been assumed by several authors (Conant, 1975; Price, 1978; McCoy, 1982; Hulse et al 2001) that the urban Erie County populations of this species were introductions. Price (1978) considered the absence of intervening populations between the “natural” range and the supposed introductions as support for the human introduction hypothesis. However, new *T. brachystoma* sites in Erie County have been located, and are 30 – 72 km west of the glacial boundary (Gray, 2008b). Furthermore, some of the new sites are located between the

supposed introductions and the “natural” populations as described by Price (1978). In light of the recently discovered sites, it may be necessary to consider alternatives to anthropogenic introduction as explanation for the presence of this species in rural glaciated areas. Two possible interpretations are that the range of *T. brachystoma* has expanded, or is expanding, or that the species once had a range that was more extensive, and has since contracted. Litter sizes for Erie County specimens range from 6 to 17 neonates. *Thamnophis brachystoma* in Erie County has been observed from 29 March – 10 October. Specimens: AMNH 105886 – 105888; BG 032; BG 043; BG 046*; BG 089*; BG 113*; BG 158*; BG 159*; BG 187*; BG 189*; BG 204*; BG 205; BG 220*; BG 252; BG 253; BG 260; BG 284; BG 286; BG 302; BG 329; BG 331; BG 342; BG 369; BG 373; CM 29881; CM 29882; CM 53678; CM 58751 – 58754; CM 61959; CM 153101; MHP 10018 – 10026; MHP 11839; MHP 11843; MHP 11845; MHP 11868; TREC R-007; TREC R-009; TREC R-013; TREC R-028; TREC R-029; TREC R-034.

Northern Ribbon Snake, *Thamnophis sauritus septentrionalis*. Northern Ribbon Snakes are most often found near or within aquatic habitats such as lakes, marshes, swamps, and ponds. *Thamnophis s. septentrionalis* is only known from a few localities in Erie County, having been found at Presque Isle State Park, and in Girard, Greene, Millcreek, Union, and Waterford Townships. McKinstry and Felege (1974) reported an average TL of 70 cm (range 42 – 96 cm) and an average weight of 57 grams (range 9 – 120 g) for five Erie County specimens. Erie County *T. sauritus* have been observed 9 May to 26 November. We have observed Northern Ribbon Snakes active in neighboring Crawford County in late March. McKinstry (1975) noted that Ribbon Snakes at Presque Isle State Park were particularly “abundant” during sunny days in October. A Northern Ribbon Snake captured on 8 July 2007 in Waterford Township produced a litter of 24 young on 2 Aug 2007. This is two less than the maximum recorded litter size (26) for the species, and is substantially higher than the maximum of 13 for Pennsylvania specimens (N=8) noted by Hulse et al (2001).

Specimens: BG 064*; BG 291*; CM 478; CM 1432; CM 1485; CM 1500; CM 1915; CM 1916; EUP 125; MHP 10027; MHP 11849; TREC R-011; TREC R-023

Eastern Garter Snake, *Thamnophis sirtalis sirtalis*. The Eastern Garter Snake is a common snake in Erie County, and can be found in a wide variety of habitats, including old fields, meadows, forest edges, along streams and other bodies of water. It has been found in the City of Erie, and Amity, Concord, Conneaut, Fairview, Girard, Greene, Greenfield, Harborcreek, LeBoeuf, McKean, Millcreek, North East, Springfield, Summit, Union, Venango, Washington, Waterford, and Wayne Townships. Melanistic individuals are known to occur at Presque Isle State Park. Litter sizes for Erie County females range from 8 – 50, with dates of parturition being between 14 July and 31 August. McKinstry and Felege (1974) reported an average TL of 490 mm (range 160 – 730 mm), and an average weight of 41 grams (range 20 – 161 g) for 93 Erie County specimens. Our Erie County sample averaged 386.8 mm SVL (n=26, sd=110.8, range 205-648), and 495.9 mm TL (n=25, sd=132.9, range 260-795). Gray et al (2001, 2003) reported on anomalies observed in the litters of females collected from a Millcreek Township population. *Thamnophis sirtalis* has been observed between 27 March and 1 December in Erie County.

Specimens: AMNH 147196; AMNH 152254; AMNH 152255; AMNH 154312; AMNH 154314; BG 004*; BG 005*; BG 011 – 014; BG 029; BG 030; BG 034*; BG 035 – 037; BG 041*; BG 042*; BG 047*; BG 054*; BG 057* – 060*; BG 062*; BG 072; BG 077; BG 081*; BG 087*; BG 090; BG 093*; BG 100; BG 102; BG 149*; BG 150*; BG 167*; BG 169*; BG 173*; BG 174*; BG 179*; BG 180; BG 190*; BG 192*; BG 212*; BG 213*; BG 214; BG 230*; BG 249; BG 282*; BG 283*; BG 287*; BG 296* – 298*; BG 311; BG 312; BG 356; BG 372; BG 374; BG 379; BG 382; BG 385; CM 474 – 480; CM 1433; CM 1486 – 1499; CM 1501 – 1505; CM 5350; CM 28024; CM 34278 – 34279; CM 50767; CM 144176 – 144181; GU 83; GU 84; MHP 10043

– 10075; MHP 11472; MHP 11848; MHP 11856; 11859; MHP 11862; MHP 11865; MHP 11870; UCM 61071 – 61078; UCM 61080 – 61081; TREC R-008; TREC R-030

Eastern Hognose Snake, *Heterodon platirhinos*. The Eastern Hognose Snake prefers areas with sandy soils in which it can burrow. These sites may be open or forested. In Erie County, the Eastern Hognose Snake is only known from Presque Isle State Park, where it has almost certainly been extirpated. The last specimen was collected from the park in 1933, by R. R. Carr. Carnegie Museum of Natural History records indicate that *H. platirhinos* has been collected between 5 June and 13 September at Presque Isle State Park.

Specimens: CM 472; CM 1519; CM 1980 – 1983; CM 2028; CM 2029; CM 6618

Northern Ringneck Snake, *Diadophis punctatus edwardsii*. The Northern Ringneck Snake is known from Amity, Conneaut, Greene, Harborcreek, Millcreek, North East, Union, and Waterford Townships. *Diadophis p. edwardsii* is common at most of the known localities in Erie County, especially in wooded areas with plenty of cover and plethodontid salamanders, this species' preferred prey. McKinstry and Felege (1974) reported an average TL of 35 cm (range 18 – 42 cm) and an average weight of 9 grams (range 2 – 16 g) for six Erie County specimens. Our Erie County sample averaged 284.7 mm SVL (n=5, sd=48.3, range 227.3-350), TL averaged 363.6 mm (n=5, sd=54, range 302.1-434.6), mean weight was 7.6 g (n=5, sd=4.6, range 3-15). In Erie County *Diadophis p. edwardsii* has been observed between 6 April and 30 September.

Specimens: BG 008; BG 103; BG 135*; BG 136*; BG 156*; BG 162*; BG 175; BG 181*; BG 222*; BG 224*; BG 226*; BG 227*; BG 290; BG 293; BG 295; BG 390

CM 37207 – 37210; CM 144174; CM 144175; CM 144185; CM 144186; MHP 9829; MHP 9830; MHP 9832 – 9834; MHP 9837 – 9840

Northern Black Racer, *Coluber constrictor constrictor*. Harold Surface (1906) reported that he had received a specimen from Waterford. This species may have been extirpated from the county, or if it occurs in the county, it is rare and occurs in isolated populations. *Coluber constrictor constrictor* has been found in adjacent Ashtabula County, Ohio (Morgan and Rome Townships) as recently as 1980 (Wynn and Moody, 2006).

In Pennsylvania, Northern Black Racers inhabit old fields, meadows and agricultural areas, and may be active from mid-April to late October (Hulse et al. 2001). These snakes are diurnal and not found under cover as often as other species (Hulse et al 2001), and therefore, may not be as readily detected using coverboards. If a specimen is found in Erie County, it should be retained for verification by a herpetologist, or alternatively a good quality photograph should be taken (preferably with a close view of the body scales), and submitted to a herpetologist or the Pennsylvania Online Herpetological Atlas.

Smooth Green Snake, *Liochlorophis vernalis*. The Smooth Green Snake is found in open fields, meadows, and ecotones. *Liochlorophis vernalis* is known from Amity, North East, Springfield, and Waterford Townships. Surface (1906) lists E. A. Baron as providing a specimen from McKean. On 9 August 1999, a nest with seven eggs was found in a cavity beneath a board at a Springfield Township site. Six Erie County specimens averaged 306.5 mm SVL (sd=41.5, range 248-370.5), and 442 mm TL (sd=49.8, range 367-510). In Erie County *Liochlorophis vernalis* has been observed 5 April to 28 October.

Specimens: BG 022; BG 078; BG 086*; BG 098; BG 292*; BG 294*; MHP 9913; MHP 9914; MHP 11836; MHP 11863; UMMZ 74737; TREC R-003

Eastern Rat Snake, *Elaphe alleghaniensis*. The Eastern Rat Snake is found in deciduous forest, ecotonal areas, and frequently in old dilapidated barns. *Elaphe alleghaniensis* is known from only a few sites in Erie County: from within the City of Erie, as well as Conneaut, Fairview, Millcreek, North East, and Springfield townships. Surface (1906) reported specimens from Miles Grove and North East. An Erie County specimen was 1120 mm SVL and 1320 mm TL. The Eastern Rat Snake has been observed in Erie County from 21 April to 13 October.

Specimens: BG 084; BG 085*; BG 107; BG 176*; BG 202*; BG 211*; BG 219*;
BG 300; BG 315; MHP 9942 – 9945; MHP 9958; MHP 11867

Eastern Milk Snake, *Lampropeltis triangulum triangulum*. The Eastern Milk Snake is common in Erie County, and is reported from the City of Erie, Amity, Fairview, Girard, Greene, Greenfield, Harborcreek, McKean, Millcreek, Springfield, Union, and Wayne Townships. *Lampropeltis t. triangulum* is usually found under debris in open fields, meadows, or ecotones. On 13 July 1997, a female (750 mm SVL; 848 mm TL) collected from a Millcreek Township site deposited eleven eggs, which hatched 3 September. The weight of hatchlings (6 females :5 males) averaged 4.1 grams. McKinstry and Felege (1974) reported an average TL of 490 mm (range 230 – 910 mm) for seventeen specimens from Erie County. Our sample of Erie County *L. t. triangulum* averaged 684.3 mm SVL (n=6, sd=78.3, range 615–811), and 814.8 mm TL (n=7, sd=99.8, range 725–960). Eastern Milk Snakes in Erie County have been observed from 28 April to 10 October.

Specimens: BG 009; BG 019; BG 024 – 027; BG 044*; BG 045; BG 056; BG 082*; BG 091*; BG 117 – 122; BG 183; BG 184*; BG 194*; BG 200*; BG 201*; BG 203; BG 206; BG 215*; BG 310; CM 467 – 471; CM 29880; MHP 9869 – 9875; MHP 10035; TREC R-015

There is only a single lizard species found in Erie County

Five-lined Skink, *Eumeces fasciatus*. In Erie County, the Five-lined Skink is found in old fields and ecotonal areas between field and forest. This species is known only from a few sites in Conneaut and Springfield Townships. On 22 May 1991, two Five-lined Skinks were observed mating on abandoned railroad bridge in Conneaut Township. The female was maintained in captivity, and produced nine eggs on 21 June, eight of which hatched on 21 July. A female was found brooding eleven eggs in a cavity beneath a piece of tin on 4 August 1997 in Springfield Township. A female captured 27 June 2003 in Conneaut Township produced 12 eggs in captivity on 12 July, 11 of which hatched on 12 Aug. Three Springfield Township Five-lined Skinks averaged 68 mm SVL (sd=7.0, range 61–75), TL averaged 166.7 mm (sd=9.1, range 157–175). Erie County *Eumeces fasciatus* have been observed from 29 March – 29 September.

Specimens: CM 119167; CM 119168; CM 148007; TREC R-002

There are nine turtle species known to occur in Erie County.

Wood Turtle, *Glyptemys insculpta*. The Wood Turtle is a streamside species, and often utilizes nearby woods, meadows, and old fields. *Glyptemys insculpta* were collected from “near Erie, Presque Isle” in 1933 and “Erie Harbor” in 1934. Considering the strong association of this species with stream habitats, it seems unlikely that Wood Turtles ever existed on the peninsula of Presque Isle in an established population. It is probable that if a population occurred around Presque Isle Bay, it was in the vicinity of some of the streams entering the bay, such as Cascade Creek. No additional specimens have been documented in the county. Garber and Burger (1995) documented the extirpation of a Connecticut Wood Turtle population following the permitting of hiking and fishing in an area that was formerly closed to the public. There have been occasional unsubstantiated reports of this species in the French Creek Watershed in the eastern portion of Erie County.

Further work is needed to confirm the presence of this species in that area. Both specimens in the Carnegie Museum of Natural History were collected in August.

Specimens: CM 6880; CM 7503

Common Snapping Turtle, *Chelydra serpentina serpentina*. The Common Snapping Turtle is found in a wide variety of habitats, from vernal pools to large lakes and streams. The Common Snapping Turtle has been found at Presque Isle State Park, and in Amity, Conneaut, Girard, Elk Creek, Fairview, Girard, McKean, Millcreek, Springfield, Union, Venango, Washington, Waterford, and Wayne Townships. Ten Erie County Common Snapping Turtles averaged 237 mm CL (sd=85.1, range 101-381). *Chelydra s. serpentina* has been observed from 29 March to 9 September in Erie County.

Specimens: AMNH 152185; CM 3041; CM 3193; CM 144168; CM 144169

Common Musk Turtle, *Sternotherus odoratus*. The Common Musk Turtle in Erie County is known from Presque Isle State Park in Millcreek Township, and possibly Springfield Township (Aquatic Ecology Associates, 1977a). Matson et al (2004) found a specimen in Conneaut Creek in Ohio, near the Ohio – Pennsylvania border. Due to high water conditions the previous week, they suggested that it may have been swept downstream from Pennsylvania waters; therefore it is possible that this species occurs in Conneaut or Springfield Townships in Erie County as well. Eighteen Common Musk Turtles from Presque Isle averaged 103.1 mm CL (sd=9.2, range 83-114); weight averaged 184.9 g (n=14, sd=48.6, range 106-245). *Sternotherus odoratus* has been observed from 24 April to 30 September.

Specimens: CM 3185; CM 7500; CM 7501; CM 21740; EUP 112; EUP 148

Spotted Turtle, *Clemmys guttata*. The Spotted Turtle is uncommon in Erie County, having been found only in the western half of the county, including Presque Isle. This species prefers more shallow habitats, such as vernal pools, marshes, small slow-flowing creeks, and occasionally, the shallow edges of ponds and lakes. Carapace length of Erie County Spotted Turtles ranged from 80.7 – 121.8 mm (X = 106.5; sd = 8.1; n = 20) in males, and 85.5 – 114.8 mm (X = 105.6; sd = 7.6; n = 18) in females. Weight of these same turtles was 88 – 225 grams (X = 174.4; sd = 31.5; n = 20) in males, and 92 – 241 grams (X = 189.7; sd = 36.1; n = 18) in females.

A western Erie County population was estimated to contain 35 – 45 (95% confidence interval) adult turtles (Gray, 2004). The Spotted Turtle in Erie County has been observed between 26 February and 20 July. In adjacent Crawford County, *Clemmys guttata* have been seen active as late as early October (Anderson and Stull, 1995.)

Specimens: CM 3204; CM 7502

Blanding's Turtle, *Emydoidea blandingii*. This species is rare in Erie County, and is only known from Presque Isle State Park, the only site in Pennsylvania where this species is currently known to occur. *Emydoidea blandingii* is usually found in habitats containing a mosaic of interconnected habitats, such as marshes, wet meadows, ponds, and slow moving streams (Hulse et al. 2001). Sightings of *E. blandingii* have been made between 24 April (R. Grubbs, pers. comm.) and September (Anderson, 1983). Hulse et al (2001) considered specimens at Presque Isle as possible waifs from other populations. However, the recent increase in sightings of at least five different individuals at the park suggests that this might not be the most parsimonious explanation. The status of this species at Presque Isle is in need of additional study.

Specimens: TREC R-035.

Eastern Box Turtle, *Terrapene carolina carolina*. The Eastern Box Turtle is rare and may be extirpated from Erie County. *Terrapene c. carolina* is reportedly most often found in deciduous forest and ecotonal areas between forest and old field (Hulse et al 2001). It has been recorded from Presque Isle State Park, and also from Fairview and Millcreek Townships. However, the recent observations of this species in Fairview and Millcreek were most likely released pets. When captured, the Fairview individual did not display the typical defensive behavior of this species – withdrawal into the shell.

The specimens in the Carnegie Museum were collected between 7 June and August.

Specimens: CM 3168; CM 7504

Common Map Turtle, *Graptemys geographica*. In Erie County, the Common Map Turtle is found in Presque Isle State Park and Presque Isle Bay, and occasionally along the Lake Erie shoreline to North East, especially in protected harbors. It has been introduced to Edinboro Lake. Records exist for the City of Erie and the townships of Fairview, Millcreek, North East and Washington. At Presque Isle, the Common Map Turtle is abundant. The Common Map Turtle prefers large bodies of water, such as rivers and lakes with basking sites that provide access to deep water. A sample of twenty-seven male Common Map Turtles from Presque Isle averaged 110.4 mm CL (sd=12.2, range 58-130); male mass averaged 172 g (n=17, sd=22.7, range 133-217); females averaged 220.9 mm CL (n=18, sd=20.9, range 172-245); female mass averaged 1380.9 g (n=18, sd=374.4, range 587-2079). *Graptemys geographica* has been observed from 29 February to 4 November.

Specimens: AMNH 146744; CM 3006 – 3008; CM 3040; CM 3199; CM 3215; CM 7483; CM 7505; CM 58880; EUP 24-28; EUP 38-39; EUP 122-124; EUP 134 ; EUP 147; MCZ 54707; USNM 51192

Midland Painted Turtle, *Chrysemys picta marginata*. The Midland Painted Turtle has been found in just about every type of aquatic habitat in Erie County, including swamps, marshes, vernal pools, and man-made ponds to name just a few. *Chrysemys p. marginata* is a common species in Erie County. It has been observed at Presque Isle State Park, and in Amity, Conneaut, Fairview, Greene, Greenfield, Harborcreek, McKean, Millcreek, Springfield, Union, Venango, Washington, and Waterford Townships. Males from Erie County average 119.2 mm CL (n=27, sd=14.1, range 92-141); while females averaged 124.2 mm (n=20, sd=26.8, range 78-155.5). Juveniles from Millcreek Township (n=6) averaged 60 mm CL (sd=10.6, range 50-78.3). Mass for five adults averaged 268.6 g (sd=50.6, range 201-325). *Chrysemys p. marginata* has been observed in every month in Erie County, with the earliest date being 6 January, and the latest being 7 December.

Specimens: CM 3009 – 3011; CM 3039; CM 3080; CM 3151; CM 3175; CM 3218; CM 3221; CM 7482; CM 7496 – 7499; CM 7508; CM 7755; CM 7756; CM 12318; CM 21741; CM 21742; CM 30317; CM 33673; CM 35137; CM 144167

Eastern Spiny Softshell, *Apalone spinifera spinifera*. The Eastern Spiny Softshell is uncommon in Erie County, and has been found at Presque Isle State Park, as well as in the Conneaut Creek drainage in Conneaut and Springfield townships, and in the French Creek drainage in Greene, LeBoeuf, Washington, and Waterford Townships. In Erie County, *Apalone s. spinifera* has been observed between 13 April and 5 August.

Specimens: CM 1321; CM 3012; CM 3038; CM 3192; CM 3222; CM 43865; EUP 2-6

Possible species.

The following species have not been documented in Erie County. However, in several

field guides, the depicted ranges of these species include Erie County.

Longtail Salamander, *Eurycea longicauda longicauda*. Hulse et al (2001) show the likely distribution of this species as including all of Erie County. However, there are no museum specimens, nor literature records for this species in Erie County (McCoy 1982). In Ohio, the closest record to Erie County is in southeastern Ashtabula County (Pfungsten and Matson 2003); in New York the range only extends to southeastern Chautauqua County (Gibbs et al. 2007). A recent survey of amphibians and reptiles along Conneaut Creek in Ashtabula County, Ohio failed to find any *Eurycea longicauda* (Matson et al 2004). In addition, the authors of the current paper have spent a considerable amount of time in the field throughout Erie County and have not observed this species.

Western Chorus Frog, *Pseudacris triseriata triseriata*. Like the Longtail Salamander, the range of the Western Chorus Frog has been illustrated as including Erie County (Conant and Collins 1998; Hulse et al 2001). No museum specimens and no literature records are known from Erie County (McCoy 1982). The Western Chorus Frog is known from southeastern Cattaraugus County, New York (Gibbs et al 2007) and southeastern Ashtabula County, Ohio (Davis and Menze 2000). *Pseudacris t. triseriata* is reported to be somewhat tolerant of human-altered landscapes, as long as pollution is not severe (Conant and Collins 1998). This diminutive anuran should be sought in swamps, marshes, and water-filled roadside ditches, especially in border regions in Concord, Conneaut, Springfield, and Wayne townships.

Nonnative Species.

The following are examples of nonnative amphibian and reptile taxa that have been found in Erie County: *Chrysemys picta picta*, *Terrapene carolina triunguis*, *Terrapene ornata* (McKinstry, 1987), *Trachemys scripta elegans*, *Anolis carolinensis*, *Rhaphotyphlops braminus* (Paul Curtis, pers. comm.), *Caiman crocodilus* (McKinstry, 1987). *Graptemys pseudogeographica* (Robert Wellington, Peter Lindeman, pers. comm.), and *Osteopilus septentrionalis* (Mike Dohanec, pers. comm.).

Most of these specimens were released or escaped pets, although some arrive as stowaways in shipments of products. Most of these species are unlikely to become established, as they are not adapted to survive the harsh winters, but a few could potentially establish in the county (e.g. the Red-eared Slider). Nonnative species and released pets present several threats to native species, such as the potential to introduce disease or genes into populations where their introduction would be detrimental. They may also compete with native populations, possibly causing declines.

Status and Conservation of Erie County Amphibians and Reptiles.

Habitat loss, alteration, and fragmentation are suspected to be the greatest threats to global amphibian and reptile populations (Mitchell and Klemens, 2000; Semlitsch, 2003; Gallant et al. 2007). As urban and suburban development continues in Erie County, amphibian and reptile habitat will continue to decrease. The county contains a variety of protected habitats (two state parks, 16 state game lands, one county park, and numerous municipal parks), but most are small and scattered, and as such will become increasingly insular. We have witnessed habitat alteration at many sites that may have negatively affected species of amphibians and reptiles (Gray, 2006; 2007a and b). Conservation of Erie County's amphibian and reptile populations will require educating the public about the importance of biodiversity, the encouragement of responsible land use practices, and additional land protection, including acquisition and conservation easements.

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Editors Note: In the last issue Vol. 44, No. 1, pp. 1-7, the figures 1 and 2 were inadvertently switched during type setting. The figure on page two belongs under the caption on page 3 (Figure 2) and the figure on page three belongs under the caption on page two (Figure 1). We apologize for any inconvenience this may have caused.

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